Wireless Medical Enterprise Delivering Information to the Point-of-Care

Telemedicine Directorate

North Atlantic Regional Medical Command

Walter Reed Army Medical Center

Background

Islands of PDA use (admin functions - limited clinical use)

→ GYN – Document the reside clinical experience

↓

PDAs for residents

↓

Need for forum to determine requirements

↓

Created a functional user group
Objective: Determine clincal requirements and preliminary objectives

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Background
"The High-Tech Ward"

Criteria for Selection

- Number of specialties on ward
  - Fewer is better
- Stable leadership and staff
  - Low turn-over rate
- Good communication & teamwork among staff
  - good physician, nursing & admin report
- Staff-buy in
- Ground-up start
  - Limits preconceptions
  - Reaps the quick successes
- Physical environment
  - layout, size
  - complexity of medical devices

Work Group Composition

- Nursing (variety of levels)
- Surgery (Neurosurgery physicians)
- Information Mgmt
- Patient Admin
- Telemedicine
- Ward 58 Staff
  - clinical and admin
- Pharmacy

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P6 Funded Project: Wireless Medical Enterprise Solution

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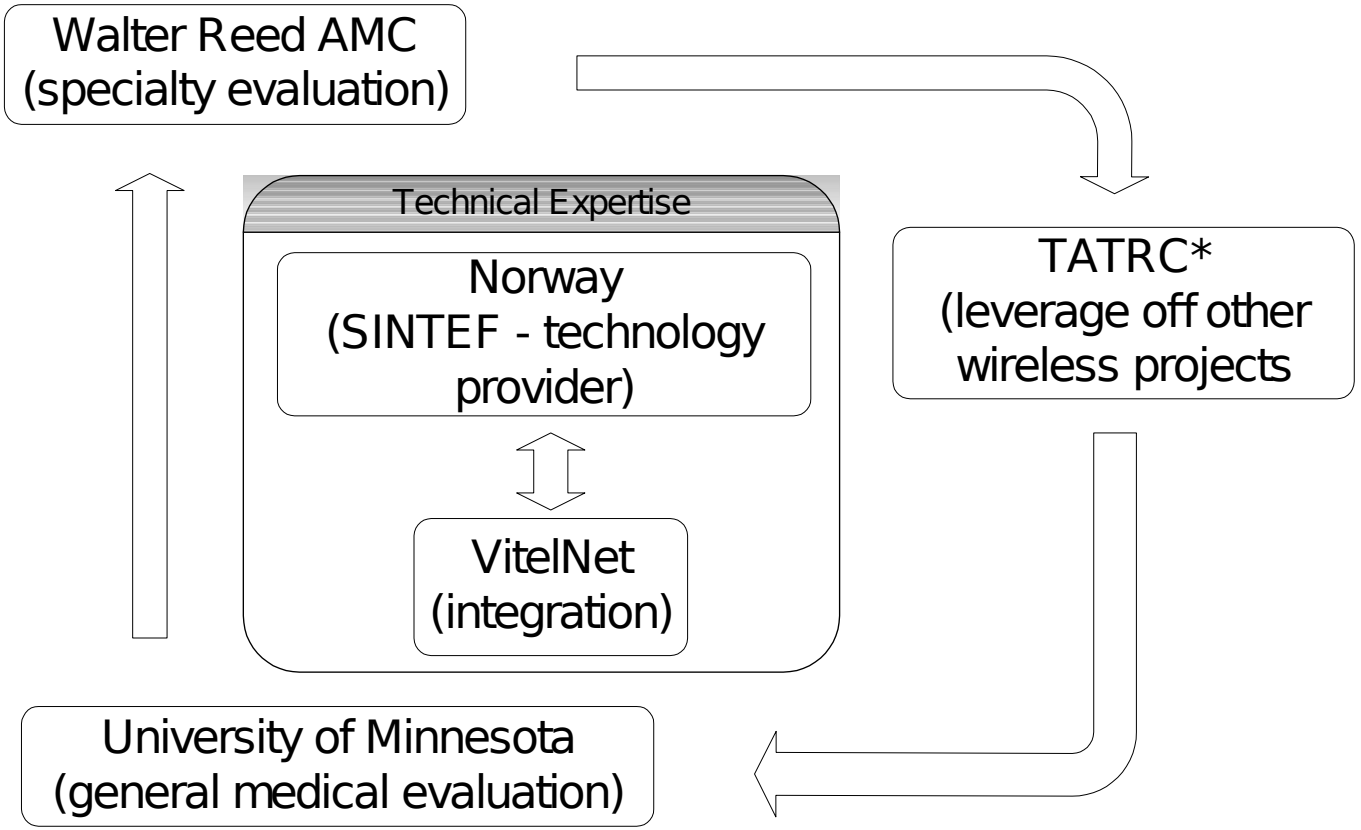
Background
P6 Funded Project

Wireless Medical Enterprise Solution



*Telemedicine & Advanced Technology Research Center

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P6 Funded Project: Wireless Medical Enterprise Solution

P8 Funded Project: Determine Requirements for a Wireless Medical Enterprise Solution

Heavy involvement in eMail user group and on-line collaborative effort

Research Partners:
- MHS-PEO (Workflow integration)
- TMA-OSD (HIS2 requirements)
- USAMISSA (admin funcunality)
- SAIC (HIS integration)

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Resources

- USA Medical Research & Materiel Command
  - $2.0M joint US/Norway effort (+ up for FY ’02)
  - $2.5M secure telemedicine initiative (+ up for FY ’02)
- Directorate of Information Management
  - Integrated Clinical Database model (lessons learned)
  - Infrastructure upgrade/preparation (expertise)
- Outcomes Management
  - Integrated Clinical Database model (lessons learned)
  - Database expertise
- Telemedicine Directorate
  - Project Management, Web & Db expertise
- Walter Reed clinical collaborative work groups
  - HTW – WTIRT - Outcomes
- Outside organization partnerships

  TATRC-TMA-USAMISSA-MC4-MHS/PEO

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Critical Success Factors

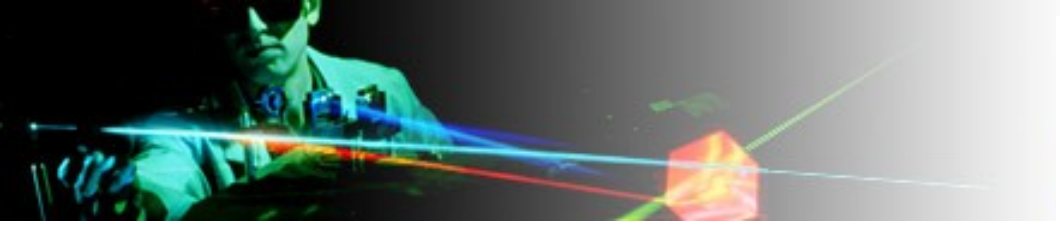
- Strong clinical involvement
- Establish an open collaborative environment
  - Spans functional lines
  - Among other information accessibility (IA) projects
    - *ICDB*-Outcomes-Intranet-Internet-Db Consolidations*
- Convergent effort
- Resources must be available (dollars & man-hours)
- Command support

*Integrated Clinical Database

Preliminary Objectives

- Mitigate medical errors
  - Intravenous Medication Administration
  - Oral Medication Administration
- 30 minute time savings per day per physician
- Standardize clinical practice guidelines
- Accurately account for workload
- Optimize billing procedures
- Enhance the medical education experience
- Facilitate process reengineering

NOTE: Grey bullets indicate follow-on objectives



Method
Phased Approach

	1	*2*	*3*
Neurosurgery	In-patient	Critical care	Out-patient
GYN	Out-patient	In-patient	Critical care
Orthopedics	Out-patient	-	-
Pulmonary	Critical care	Out-patient	In-patient
Nursing	In-patient	Critical	Out-patient
DeWitt AC			

Optimize functional user groups:
1. Service-specific (Neuro, GYN, Pul, Ortho)
2. Nursing
3. Technical (WTIRT)

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Mitigate Medical Errors

- Objective prompted by recent *Institute of Medicine* Reports from their *Committee on the Quality of Healthcare in America*:

  "To Err is Human: Building a Safer Health System", Nov. 1999
  - Broke the silence surrounding medical errors and their consequences
  - Key Theme: Legitimate concerns discourage reporting errors
  - Findings based on two studies marking death by medical error between 44,000 and 98,000 patients annually
  - Recommends a 50% reduction in med errors over the next 5 years
  - Four-part Plan:
    - A National Center for Patient Safety
    - Mandatory and Voluntary Reporting Systems
    - Role of Consumers, Professionals, and Accreditation Groups
    - Building a Culture of Safety

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Mitigate Medical Errors

- Objective prompted by recent *Institute of Medicine* Reports from their *Committee on the Quality of Healthcare in America*:

  "*Crossing the Quality Chasm*", Mar 2001
  - Calls for immediate action to improve care over the next decade
  - Offers a comprehensive strategy (public and private sector involvement)
  - Care providers and organizations should focus on improving care for common, chronic conditions (heart disease, diabetes, asthma) that are the leading cause of illness in the US and consume a substantial portion of healthcare resources
  - Use of Information Technology is key (i.e. exploit the capabilities and pervasiveness of email)
  - Track and monitor quality improvements in six key areas:
    - Safety
    - Effectiveness
    - Responsiveness to patients
    - Timeliness
    - Efficiency
    - Equity

Mitigate Medical Errors
Walter Reed Efforts

- Created the Bar-coding Project Action Team
  - Composed of a wide-variety of care providers, administrators and IT folks
- Location selected to pilot the initiative (based on previous workgroup criteria)
  - Ward 58 - Neurosurgery Ward (Walter Reed AMC)
  - In addition, the lab and blood bank will be invaluable follow-on players
- Vendor selection underway
- Basic Goals:
  - Integration with HIS and point of use (POU) supply & pharm system
  - Barcode Armed Forces ID Card coded info (demographics)
  - Identify patient, care provider and medication administered at bedside via barcode reading of UPC equipped wristbands, cards and labels
  - System of flags to alert staff (contraindications, discontinued orders, error msg for each of the ‘five rights’ of med admin: dose, time, drug, patient, route)

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30 Minute Time Savings
(per day, per physician)

- Gynecology Out-Patient Clinic
- (24) providers
  - technology friendly population
- Implement a WLAN and distribute (24) Compaq iPaqs
- Phase 1 (Read-only access to data)
  - Review lab & rad results and orders
  - Review pharm orders
  - Vital signs, weight, temperature
  - Review demographics
  - Critical value notification
  - Reference material
    - Drug reference
    - Clinical practice guidelines
    - Decision support tools
- Phase 2 (data-entry)
  - Order entry (lab/px)
  - Charge capture
  - Vitals capture

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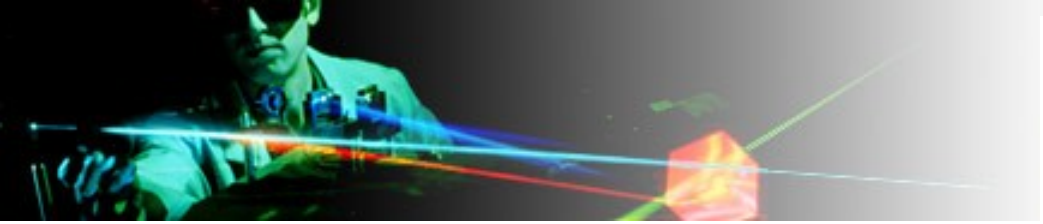

30 Minute Time Savings

(per day, per physician)
Project of Opportunity thru TATRC

- Family Practice Clinic, DeWitt ACH
- (17) Residents
  - Untapped technology-savvy population
- Goal: Determine requirements for clinical handheld use
- Project Partners: TATRC & American Institute of Research (AIR)
- Distribute (17) Handera 330 PDAs with commercial clinical applications
  - Tarascon Pharmacopia, ATP Cholesterol Management, HanDbase, Pepid Reader (NBC), 5-Minute Clinical Consult & others

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30 Minute Time Savings

(per day, per physician)
Project of Opportunity thru MHS-PEO

- Orthopedics Outpatient Clinic
- (6) Orthopedic physicians
- Goal: Streamline clinic operations and improve patient flow through handheld and wireless technology
- Project Partner: MHS-PEO (IM) & Picos
- Conducted time-motion study over a six week period
  - Back brief pending
- Implement WLAN & distribute tablet computers with Picos software

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Concept
Use COTS Technology

- Handheld Computers (Palms-Pocket PCs-Tablets)
- Laptops and workstations
- Cellular Devices (Cell Phones, Pagers, PDAs, RIM)
- Wireless LAN/WAN
- Web-browsers
- Barcode technology
- Personal Information Management (PIM) functions (i.e. Outlook features)

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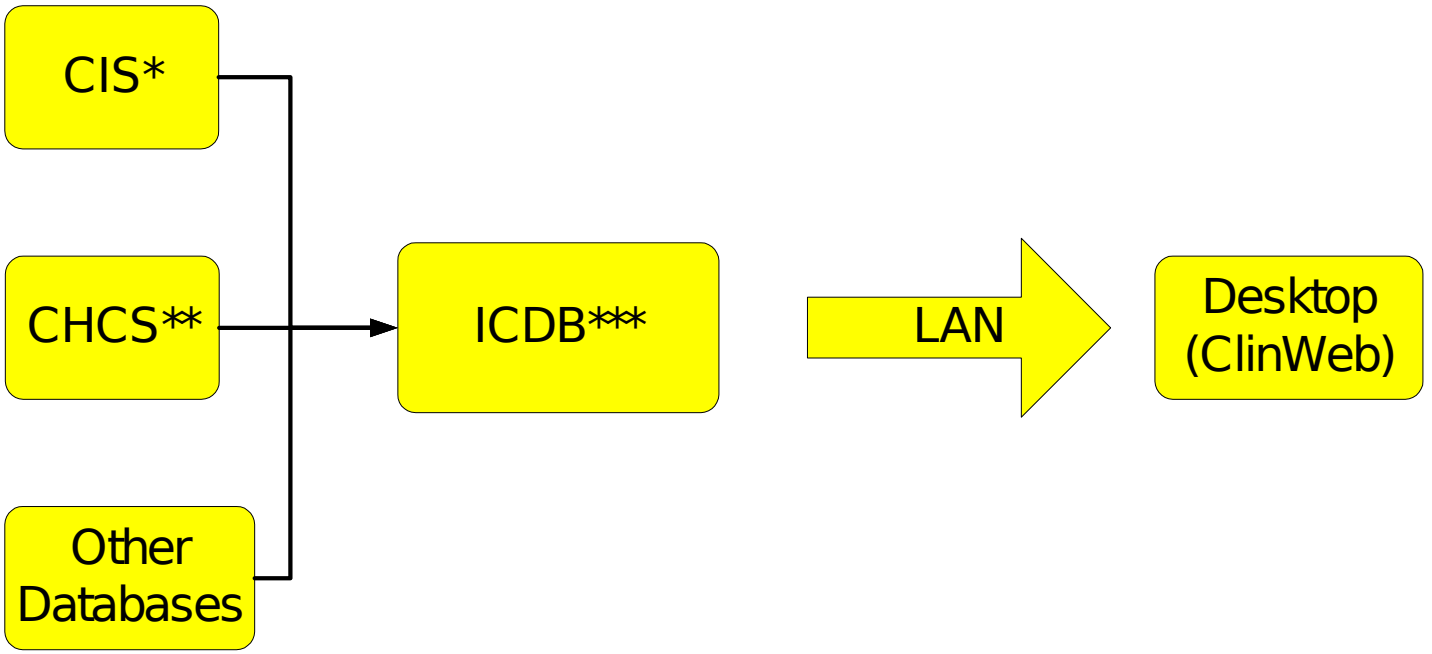
Concept
Use ICDB Model



* Clinical Information System
**Composite Healthcare System
***Integrated Clinical Database

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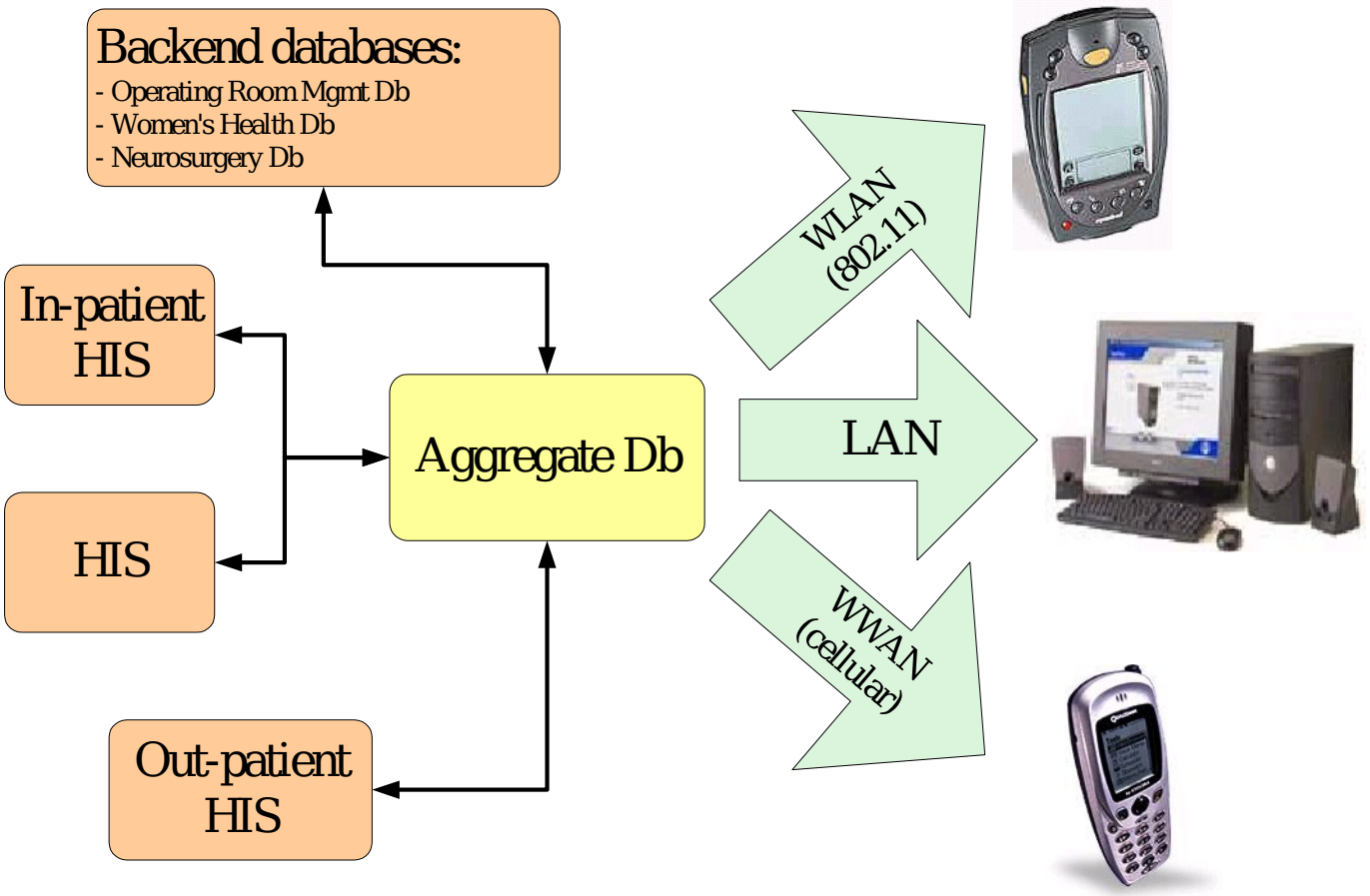
Concept

Pool Data, Port Information



*HIS = Hospital Information System

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Concept

On-Site End User Device

- Uses COTS devices (potentially ruggedized)
- Uses a wireless LAN
  - No syncing; however, solution should accommodate legacy synced/tethered users
- Integrated bar code reader and IEEE 802.11(b) WNIC
- Device agnostic
  - Supports laptop, tablet, PDAs (Pocket or Palm OSs), RIM

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Concept

Off-Site End User Device

- Uses COTS devices
- Leverages the capabilities of the commercially available wireless WAN (cellular environment)
- Enabled by industry standard for data transmission
  - WAP, CDPD, wide-area WLAN
- Device agnostic
  - Supports laptops, cells, pagers, PDAs (Pocket or Palm OSs), RIM

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Prerequisites

- Comply with security & privacy regulations
- Ensure scalability and network interoperability of technical solution
- Ensure electromagnetic compliance
- Enable a zero-latency environment

*Wireless LAN SOW being developed

Security & Privacy

- Must raise security awareness of end-user
- Need for anti-virus software
- No patient identifiable data on device
- Will require strong authentication capability
- Must ensure data confidentiality
  - Comply with HIPAA*

*Healthcare Information Portability and Accountability Act

WLAN Scalability

- IEEE 802.11 v 802.11b
  - Frequency Hopping Spread Spectrum
    - Very scalable, limited bandwidth (2mbps)
  - Direct Sequence Spread Spectrum
    - Limited scalability, high bandwidth (11mbps)
- IEEE 802.11a
  - Limited range, high bandwidth (54Mbps)

Ensure Electromagnetic Compliance (EMC)

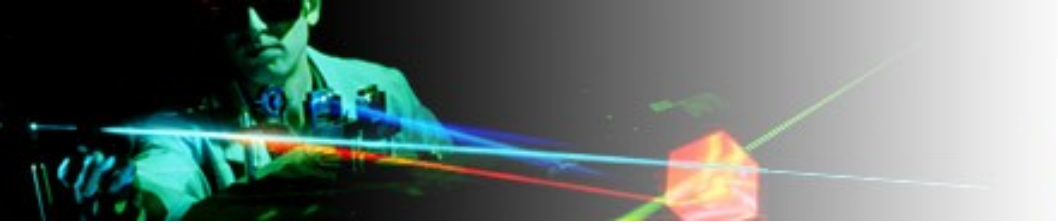
- Biomedical Maintenance – independent validation & verification (IV&V) in-progress
- Conducted a preliminary AD-HOC EMC study using (2) WLAN products
  - Symbol - *Spectrum24 & Symbol 2800 handheld*
  - Cisco - *Aironet 340 & Compaq iPaq 3670*
- Method (based on AAMI published guidance - TIR 18-1997) :
  1. Setup WLAN in biomedical lab
  2. Set Access Point to maximum power output (100mw)
  3. Used a small representative sample of medical equipment (i.e. Patient Monitoring System, Vitelsigns unit)
  4. Assess interference at varying distances
  5. Document in EMC Report
- Results: Preliminary reports demonstrated no interference
- Comprehensive testing scheduled in January at the FDA will generate a more thorough report

Strategic Planning Assumptions

- On-going collaboration across functional lines & organizations will ensure success
- User groups are key in obtaining clinical input
- Similar user interface across enterprise will foster acceptance (PC to PDA to Cell)
- Information integration & mobility will encourage clinical process reengineering
- Commitment level to clinical process reengineering will drive success

Lessons Learned

- Develop a comprehensive strategy
- Gear toward a wireless environment
- Develop a phased migration to accommodate legacy users
- Develop early prototypes, modify based on clinical use
- Gain user acceptance by incorporating PIM functions
- Be device agnostic. Do not plan for one device…they change
- Automate content management and distribution
- Beware of vendor promises, they fall through
- Avoid point solutions



“There is a consensus that we begin the project with very few, though, attainable objectives. Keep the project focused; follow-on projects are inevitable and should be encouraged”

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Conclusion

- Platform independence & database aggregation are essential
- Clinical buy-in & participation is paramount
- On-going collaboration across lines & organizations will ensure success
- User groups are key in obtaining input

Questions

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Medical